

## **Appendix A.**

**Summary of fish and sediment monitoring, source assessment, TMDL  
and remediation activities by river basin**

## POTOMAC RIVER BASIN

- **Potomac River basin - the following tributaries between the VA/MD state line near Rt. 340 bridge (Loudoun County) to the I-395 bridge in Arlington County (above the Woodrow Wilson Bridge): Goose Creek up to the Dulles Greenway Rd Bridge, Broad Run up to the Rt 625 Bridge, Difficult Run up to the Rt 7 Bridge, and Pimmit Run up to Rt. 309 bridge.**

***Fish and sediment monitoring:*** Conducted in this watershed in 1996, follow ups 2001 and 2004. Previous sampling: 1989, 1986, 1985, 1983, 1979.

***Voluntary Remediation:*** Atlantic Research Corp (Fairfax County) - PCBs were detected during site demolition at concentrations up to 90 ppm, in a small area on the site. The contaminated soil was excavated using a soil vacuum and transported offsite for disposal. Confirmation sampling was non-detect in the vacuumed areas.

***Voluntary Remediation:*** Carlyle (Alexandria) - Remediation associated with 135 ppm PCBs occurred before DEQ involvement with the Site. Upon entering the VRP, one of the Carlyle Sites, the U.S. Patent and Trademark Office, had detections in soil with a maximum detection of 48 ppm. As part of site development levels between 15 ppm and 48 ppm were removed. 15 ppm was left in place and is covered by a multi-storied office building. Approximately 450,000 cubic yards of soil were removed from the site. A Certificate has not been issued for this site.

***Voluntary Remediation:*** Davis Industries (Arlington) - PCBs were detected in excess of 1000 ppm. Impacted soils were consolidated and capped on site. The surface of the cap was paved and now functions as a parking lot.

- **Potomac River Basin - the tidal portion of the following tributaries and embayments from I-395 bridge (above the Woodrow Wilson Bridge) to the Potomac River Bridge at Rt. 301: Four Mile Run, Hunting Creek, Little Hunting Creek, Pohick Creek, Accotink Creek, Occoquan River, Neabsco Creek, Powell Creek, Quantico Creek, Chopawamsic Creek, Aquia Creek, and Potomac Creek**

***Fish and sediment monitoring:*** conducted in this watershed in 1996, 1997, special study 2000, follow ups 2001, 2003 and 2004. Previous sampling: special study 1993, 1990, 1987, 1984, 1983, 1981, 1980, 1979.

***TMDL Activities:*** Also in 2003, DEQ met with representatives from the state of Maryland, the District of Columbia, EPA Region III and the Interstate Commission on the Potomac River Basin to lay the groundwork for a PCB TMDL covering the tidal Potomac. Both DC and Maryland have TMDL development schedules with completion dates by 2007. DEQ is participating in a cooperative effort led by ICPRB to secure

funding for monitoring and data compilation. Project meetings on this TMDL project are continuing.

***Remediation at Federal Facility:*** The source of the PCB contamination at the Former Woodbridge Research Facility is believed to have been associated with oil/water separator sites and associated outfalls. Additionally, the wash pad drainage area was considered a PCB source, due to historic dumping practices. A total of 1,029 tons of PCB & TPH laden soils were removed from these sources in 1995. At present, long term monitoring (LTM) activities at OU1 (Operable Unit 1) (includes Area Requiring Environmental Evaluation –AREEs - 1 through 7) & OU3 (AREEs 11, 17 and 22), consist of groundwater, surface water, sediment, storm water runoff and biota sampling. A total of six transformers and 85 capacitors were excavated/removed in 1985. The Former Woodbridge Research Facility Five-Year Review report (dated May 2003) stated that continued LTM monitoring of PCBs indicate that limited impacts to the environment currently exist. Likewise, the Five-Year Review report stated that the remedies implemented at OU1 and OU3 are protective of human health and the environment. The next Five-Year Review, for OU1 and OU3, is scheduled for FY 2008.

***Remediation at Federal Facility:*** At the Marine Corps Base-Quantico, a transformer storage area was evaluated and a "No Action" Record of Decision was signed in 2000. Upon further study downstream in a drainage swale, levels up to 1400 ppb PCBs were found. This resulted in a surgical removal of approximately eight cubic yards of contaminated soils. Site 4- an old landfill- was a major area of concern in the early 1990's. In 1997 an Interim action consisting of a hot spot soil removal, offsite disposal and capping has eliminated a direct contact risk for PCBs and based on sampling to date appears to have eliminated a continuing source to the Quantico Embayment. The sediments surrounding the landfill are still contaminated with levels up to 1200 ppb. Remedial Action on these sediments is pending.

- **Bull Run near Manassas Park ( Prince William County) from the I-66 Bridge downstream to the Rt. 612 (Yates Ford Rd.) bridge.**

***Fish and Sediment monitoring:*** conducted in this watershed in 1999, follow up 2001 and special study 2004. Previous sampling: 1990, 1987.

- **Potomac River Basin - the tidal portion of the following tributaries from the Potomac River Bridge at Rt. 301 to mouth of river near Smith Point: Upper Machodoc Creek, Monroe Creek and Coan River.**

***Fish and sediment monitoring:*** conducted in this watershed in 2001 and follow up 2004.

***Remediation at Federal Facility:*** At a site at the Naval District Washington, West Area Dahlgren facility, mercury and PCBs were detected at concentrations exceeding

ecological criteria. The site-specific cleanup objectives for the remediation of mercury and PCBs in soils were set at 0.116 ppm and 0.2 ppm respectively. A removal action was completed in June 2002 to mitigate ecological risks.

## **SHENANDOAH RIVER BASIN**

- **South Fork Shenandoah River downstream from Rt. 619 bridge crossing near Front Royal, North Fork Shenandoah River downstream from Riverton Dam and Shenandoah River from the confluence of North and South Forks to VA/WV state line.**

***Fish and Sediment monitoring:*** conducted in this watershed in 1996, special study 1999, 2001. Previous sampling: special study 1992, follow up 1990, special study 1989, follow up 1988, 1987, 1985, 1983, 1979

PCB concentrations in excess of the Food and Drug Administration (FDA) action level of 2 parts per million (ppm) were initially reported in fish tissue samples collected from the Shenandoah River near Route 7 during 1987. PCB had not been detected in previous samples collected by the Virginia State Water Control Board (VSWCB) monitoring CORE program in 1979, 1983, and 1985. Elevated PCB levels were confirmed in 1988. A 1989 special study documented the presence of PCB at or above the FDA action level in fish tissue samples collected from the South Fork Shenandoah River at Front Royal and the mainstem Shenandoah River to the state line. Additional follow up samples were conducted in 1990, 1992, and 1996.

***Source Assessment:*** The source of the PCBs was identified as the Avtex Fibers, Inc. facility. The Avtex Fibers facility's VPDES discharge permit was revoked in 1989, and the facility was closed. This facility was placed on EPA's National Priority List in 1986, where it remains today. In 2001, a Total Maximum Daily Load (TMDL) was developed for the impairment. Wasteload allocations were assigned to the Avtex facility and the Warren County Landfill. The report recommended natural attenuation through burial and downstream dispersion as the actions to meet TMDL loads.

***TMDL Activities:*** In 2001, EPA led the first PCB TMDL effort in the state. This TMDL project targeted several impaired segments on the Shenandoah River in both Virginia and West Virginia. These segments were under a fish advisory dating from a spill incident at an industrial facility (Avtex Fibers). The facility is being remediated under EPA's Superfund program. The TMDL concluded that following the site clean-up, natural attenuation would result in low enough PCB levels so that no additional remedial action was required. The TMDL report can be viewed at <http://www.deq.virginia.gov/tmdl/apptmdls/shenrvr/shenpcb.pdf>

***Remediation at Superfund Facility:*** Avtex - EPA conducted a limited removal action of PCB contaminated soil from around some transformers at the site in the early 1990's. The material was containerized and disposed of at an offsite facility.

- **Lewis Creek near Rt. 252 south of Staunton downstream to the confluence of Middle River near Laurel Hill**

***Fish and Sediment monitoring:*** conducted in this watershed in 2001.

***Source Assessment:*** The source of the PCBs is unknown. A TMDL for a general standard (benthic) impairment on Lewis Creek is ongoing. As part of the TMDL study, sediments will be sampled throughout the watershed for PAHs, pesticides, metals, and PCBs. While PCBs are not expected to be the cause of the benthic impairment, information on sediment PCB concentrations throughout the watershed may be beneficial in locating or identifying PCB sources.

***TMDL Activities:*** TMDL development work on a biological impairment on Lewis Creek, a tributary to the Middle River in the Shenandoah River Basin, indicated the need for additional monitoring to address the potential toxics issues in this stream. Part of this work includes monitoring for PCBs.

## **JAMES RIVER BASIN**

- **Maury River from Buena Vista at Rt. 60 to the confluence of the James River**

***Fish and Sediment monitoring:*** conducted in this watershed in 1995 and follow up 2001. Previous sampling: special studies 1993 and 1992

***Source Assessment:*** None. The source is unknown.

Fish and sediment sampling conducted by DEQ in 2001 yielded elevated levels of PCBs in fish from the Maury River at Buena Vista, but concentrations in sediments from this location were at background levels. Upstream (Lexington) and downstream (Glasgow) sites did not show elevated levels in fish tissue. Sediment samples at Glasgow, near the mouth of the Maury River, produced elevated levels of PCBs. No other sediment sites had levels above background. To better evaluate and confirm the presence of elevated PCB concentrations in fish and sediments, DEQ-VRO staff will collect follow-up samples of fish and sediments at the previously sampled Buena Vista and Glasgow sites during fall 2004.

- **James River from Big Island Dam (below Blue Ridge Parkway) downstream to the I-95 James River Bridge in Richmond including its tributaries Hardware River up to Rt. 6 bridge and Slate River up to Rt. 676 bridge**

***Fish and Sediment monitoring:*** conducted in this watershed in 1995, follow up 2001 and special study 2003. Previous sampling: 1990, 1989, 1987, 1986, 1984, 1982, 1981, 1980, 1979

- **James River from the I-95 James River bridge in Richmond downstream to the Hampton Roads Bridge Tunnel and the tidal portion of the following tributaries: Appomattox River, Bailey Creek, Bailey Bay, Chickahominy River, Skiffes Creek, Pagan River and its tributary Jones Creek, Chuckatuck Creek, Nansemond River and its tributaries Bennett Creek and Star Creek, Hampton River, Willoughby Bay, and Elizabeth River system (Western Br., Eastern Br., Southern Br., and Lafayette River) and tidal tributaries St. Julian Creek, Deep Creek, and Broad Creek**

***Fish and sediment monitoring:*** conducted in this watershed in 1995, 1996, special study 1997, 1998, follow up 2000, follow up and special studies 2001 and 2003. Previous sampling: special studies 1994, 1993 and 1992, 1991, 1990, 1988, 1987, 1986, 1985, 1984, 1982, 1981, 1980, 1979.

DEQ conducted a PCB special study in the Lower James and Elizabeth River watershed in 1993 as a follow up the 1988 EPA National Bioaccumulation Study. In addition to routine monitoring, a more intensive sampling was done in 2001.

An evaluation of PCBs in Striped Bass of the Lower James was done in 1994.

A PCB special study was initiated in 1992 for the fresh tidal James River in the vicinity of Tar Bay near Rt. 156 bridge at Jordan Point. Two additional intensive monitoring of PCBs in fish in the fresh tidal portion of the James River Basin were undertaken in 1997 and 2003.

***Source Assessment:*** Tidal James River and Tributaries, 1997 to 2003

The Department of Environmental Quality (VADEQ) has performed two poly-chlorinated biphenyl (PCB) source assessment studies on the tidal James River. From October 1997 to September 1999 VADEQ sought to identify the source of PCBs and poly-chlorinated terphenyls (PCTs) in Bailey Bay and Creek, in Hopewell, VA. VADEQ sampled 44 sites and EPA sampled 15 sites in the Hopewell area. An unnamed tributary of Cattail Creek, a tributary of Bailey Creek, had the highest total PCB level at 32,800 ppb. None of the PCB results met the EPA TSCA notification requirement of 50 ppm, so this study ended in 1999.

The VADEQ undertook a second PCB source assessment study of the tidal James River and tributaries at 56 sites in 2003 in response to a 2002 VDH fish consumption advisory for blue catfish and carp in the tidal James River from Richmond, VA. to below Hopewell, VA. VADEQ used the Effects Range - Medium (ER-M) for sediment PCBs

of 180 ppb for tidal sites, and the Consensus Based Probable Effects Concentrations (PEC) for sediment PCBs of 676 ppb for non-tidal sites as levels of concern. These are the aquatic life use assessment criteria VADEQ uses in 305(b) reporting to EPA. Many tidal and non-tidal sites were below the ER-M or PEC levels. **These sites were not considered to have PCB levels of concern for this study:**

<b>Sample Site</b>	<b>Total PCBs, ppb</b>
Mouth of Appomattox River	0.10
Mouth of Courthouse Creek, Charles City Co.	2.2
Intermediate Terminal	18.6
Richmond STP Outfall	15.8
Koch Oil Pipeline	9.6
Deepwater Terminal, downstream side, middle, upstream side	2.94, 3.67, 3.28 resp.
Falling Creek Outfall	7.2
Brown & Williamson Tobacco Outfall	0.59
Rohoic Creek, City of Petersburg	9.0
Flint Hill Resources Pipeline	23.5
Farrar Gut near mouth	2.2
Dutch Gap Power Station outfall in James River	22.0
Dupont Teijin outfall	1.26
Phillip Morris Tobacco outfall	22.8
Powwhite Creek near mouth	27.2
Proctors Creek STP outfall	7.05
Old landfill, South Channel below I-95, City of Petersburg	9.56
South Central Wastewater Treatment Facility outfall, Appomattox River	35.8
Gravelly Run mouth below Stone Container	6.23
Smurfit-Stone outfall 004	7.08
Smurfit-Stone outfall 005 (non-tidal)	318
Va. Power substation, Hercules Road, pond below substation	45.0
Hercules (Aqualon) - Downstream of outfall 002 (non-tidal)	314
Honeywell Chesterfield outfall 002 near outfall	75.6
Honeywell Chesterfield outfall 001 channel	9.03
SIMS Metals outfall 002 (non-tidal)	198
Honeywell Hopewell outfalls 001, 002, and 003 (non-tidal)	162, 280, 498 resp.

The following **tidal sites exceeded** the tidal ER-M of 180 ppb for PCBs:

<b>Station ID</b>	<b>Station Description</b>	<b>Total PCBs, ppb</b>
	Bailey Creek mouth	346.9
	Bailey Creek at Rt. 10	775.5
	Poythress Run #2, tidal near mouth	556.3
	Honeywell Chesterfield Outfall 002 in river off mouth	598
	Honeywell Chesterfield Outfall 002 in river off mouth, depth 0.3m	348

The following **non-tidal sites exceeded** the non-tidal PEC of 676 ppb for PCBs:

<b>Station ID</b>	<b>Station Description</b>	<b>Total PCBs, ppb</b>
	SIMS Metals Fluff Pile Pipeline	768
	Kinder Morgan Pond Outfall (below SIMS Metals)	2544
	Hercules (Aqualon) Storm Drain 001	21595
	Hercules (Aqualon) Downstream of Outfall 005	1876
	Hercules (Aqualon) West Pond	1995
	Hercules (Aqualon) below West Bear Cr Pump station	5219
	Nelson Transformers - Outside Fence, off property	14105
	Nelson Transformers -Bottom of Oil / Water Separator	14533
	SIMS Metals - in RR tracks by Shredder	99965
	SIMS Metals - Downstream of Shearer	12820
	SIMS Metals - 001 Under Power Line	24979
	SIMS Metals Outfall 003	5787

VADEQ notified the US EPA Region 3 Hazardous Materials Cleanup Division on July 7, 2004, that one industrial facility was above the 50 ppm US EPA notification requirement, SIMS Metals America in Richmond, VA, with a total PCB level of 99,965 ppb.

VADEQ believes further sampling is needed within the Hercules (Aqualon), Honeywell Chesterfield, and SIMS Metals America facilities, as well as downstream in storm sewers and tributaries below Nelson Transformers. Current funding for further sampling by VADEQ is not available. Therefore VADEQ proposes letters of agreement with the facilities whose results exceeded the ER-M or PEC, which would require the facility to design and perform a further sampling program for on-site PCBs to be approved by VADEQ.

**Remediation at Federal Facility:** The source of the PCB contamination at Naval Radio Transmitting Facility (NRTF) Driver is believed to have been associated with Site 1 (Oyster House Creek Landfill), Site 5/5A (PCB Spill at Star Creek), Site 7 (West Disposal Area) and Bldg. D-10. The waste at Site 1 remains in place, but with certain restrictions (i.e. Land Use Controls - LUCs). At present, LTM activities at Driver involve groundwater, sediment and biota sampling. DEQ has recently requested that biota sampling continue in the Star and No Name Creeks. DEQ sampling in Star Creek (conducted in July 2002) indicated that PCBs in mummichogs, croaker, gizzard shad, white perch, turtle tissue and blue crab, were above DEQs trigger level (54 ppb). In 1995, a removal was conducted at Site 5/5A to address PCB contaminated soil and sediment. It has been estimated that the volume of the PCB-laden oil spill ranged from 5 to 160 gallons. Approximately 3,500 cubic yards was excavated from Site 5/5A. In 1994, surface debris were removed and a soil cover was placed over Site 7. Low level PCBs were present in Site 7 soils. PCB volume(s) and/or removal quantities were not available for activities at Site 7. In 1995, PCB contaminated soil/concrete were removed from Bldg. D-10. Approximately 240 cubic yards was excavated from Bldg. D-10 and



the surrounding area. A Five-Year Review report (dated July 2004) for Site 1 and Site 7, is currently under review.

***Remediation at Federal Facility:*** Fort Eustis has conducted several actions with respect to PCBs. At Bailey's Creek from the fall of 1999 to the summer of 2001, there were 6,637 tons of PCB contaminated sediment removed. The concentrations of PCBs that were removed ranged from less than 10 ppm to approximately 2,200 ppm. All soils exceeding 50 ppm were disposed at a Toxic Substances Control Act (TSCA) approved facility (3072 tons). The remaining soils (approximately 3,600 tons) were disposed of at a RCRA subtitle D approved landfill. Interim removal actions were conducted at Brown's Lake during the fall of 1999 while remedial action continued in to the summer of 2000. PCB levels in the sediment were less than 1 ppm. At Eustis Lake, PCBs have been detected in the lake sediment and fish tissue. The PCBs in the sediment ranged from 11 ppm to 840 ppm. The fish tissue samples ranged between 0.095 ppm to 14 ppm. The investigation of this site is complete and remediation options are currently being developed.

***Remediation at Federal Facility:*** At the Norfolk Naval Base approximately 2,700 cubic yards of metals and PCB contaminated soils were removed in 1998. In 2001 an additional 16,000 cubic yards of contaminated soil were removed. PCB concentrations ranged from 1 ppm to 300,000 ppm. Depending on the levels of contamination, soils were transported off site to different disposal facilities with those with the highest concentrations going to Utah for incineration.

## **RAPPAHANNOCK RIVER BASIN**

- **Rappahannock River from the I-95 bridge above Fredericksburg downstream to the mouth of river near Stingray Point including its tributaries Hazel Run up to I-95 bridge crossing and Claiborne Run up to Rt. 1 bridge crossing**

***Fish and Sediment monitoring:*** conducted in this watershed in 1995 and follow up 2001. Previous sampling: special study 1994, 1989, 1986, 1985, 1984, 1982, 1981, 1980, 1979

An evaluation of PCBs in Striped Bass in the Chesapeake Bay near the mouth of the Rappahannock River James was done in 1994.

- **Mountain Run from Rt. 15/29 bridge crossing near Culpeper City to the confluence with Rappahannock River**

***Fish and Sediment monitoring:*** conducted in this watershed in 1999, and follow up special study 2001. Previous sampling: special studies 1975, 1972 and 1971

***Source Assessment:*** Historical source assessment circa 1970s by the State Water Control Board, a precursor agency to the Department of Environmental Quality. See <http://www.deq.virginia.gov/ishtissue/pdf/mtnrun.pdf> for November, 1972 Mountain Run PCB Study, State Water Control Board and <http://www.deq.virginia.gov/ishtissue/pdf/mtnrun2.pdf> for June, 1977 Mountain Run PCB Study, B75-020, State Water Control Board.

## **ROANOKE RIVER BASIN**

- **Dan River within the state of Virginia from the Brantley Steam Plant Dam in Danville downstream to the confluence with Roanoke River on J. H. Kerr Reservoir, including its tributaries Hyco River up to Rt. 738 bridge and Banister River up to the Banister Dam**

***Fish and sediment monitoring:*** conducted in this watershed in special study 1993 follow up special studies 1999 and 2000, and 2002. Previous sampling: 1991, 1988, 1985, 1983, 1981, 1980, 1979, special studies 1971

***Source Assessment:*** DEQ investigated a site (South Boston landfill) in the Dan River drainage.

- **Roanoke River (upper section) from the confluence of North and South Fork Roanoke River near Gaging Station at Lafayette downstream to Niagara Dam including its tributaries Peters Creek up to Rt. 460 bridge crossing and Tinker Creek up to the confluence with Deer Branch Creek near Rt. 115**

***Fish and sediment monitoring:*** conducted in this watershed in special study 1993 follow up 1999 and 2002. Previous sampling: 1987, 1986, 1985, 1983, 1981, 1980, 1979

- **Roanoke River/Smith Mountain Lake from below the Niagara Dam on Roanoke River downstream to Smith Mountain Dam including Blackwater River arm up to the Rt. 122 Bridge**

***Fish and Sediment monitoring:*** conducted in this watershed in special studies 1993 and 1998, follow up 1999 and 2002 and special study in 2004. Previous sampling: 1994, 1992, 1987

- **Roanoke (Staunton) River from below Leesville Dam downstream to the confluence of Dan River**

***Fish and Sediment monitoring:*** *conducted in this watershed in special studies 1993 and 1998, follow up 1999, 2000 and 2002. Previous sampling: 1991, 1987, 1986, 1985, 1983, 1979, special studies 1971*

The initial investigation of PCB contamination of fish in the Roanoke River Basin was conducted in the Fall of 1971. This is documented in a report by the VSWCB titled “The Occurrence of Polychlorinated Biphenyls (PCBs) in the Roanoke and Dan Rivers - A Preliminary Report” which was issued February, 1973.

Beginning in 1979, VSWCB established several stations in the Roanoke River Basin at which fish were routinely monitored. PCBs continued to be present in fish samples collected by VSWCB and EPA at several of these monitoring stations. Data collected by VSWCB and EPA through 1991 indicated the prevalence of PCBs in fish of the Roanoke River Basin.

As a consequence of the continued occurrence of PCB contamination of fish in the basin, the DEQ conducted a more in-depth study of the Roanoke River Basin. The sampling phase of this investigation lasted from February through July of 1993. Six hundred and forty-seven individual fish specimens were collected at 14 stations on the Roanoke River and its major impoundments and one station on the Dan River near South Boston. The 1993 study is documented in a comprehensive report by the Virginia DEQ titled “1993 Roanoke River Basin Study – Assessment of Polychlorinated Biphenyls and Organochlorinated Pesticides Contamination in Fish Tissue” which was issued in October, 1996.

Following the assessment and evaluation of the 1993 data by the VDH, EPA and DEQ, a fish consumption advisory was issued for a portion of the Roanoke River in July, 1998.

A two-year, multi-phase follow-up investigation of PCBs was initiated in the fall of 1998. The second phase of the follow-up was conducted from spring through fall of 1999. In this phase, fish were collected throughout the basin including tributaries of both the Dan and Roanoke Rivers and all major impoundments or lakes.

Additional follow up monitoring were conducted in 2000 and 2002.

***Source Assessment:*** Major PCB Source Investigation Dates

- **February 1973** Virginia State Water Control Board (SWCB), Virginia Department of Agriculture and Commerce, and the Virginia Commission of Game and Inland Fisheries SWCB published “The Occurrence of PCBs in the Roanoke and Dan Rivers”. The study involved the collection of sediments and fish tissue. From the samples collected between Leesville Tail Race and Kerr Lake the highest PCB concentrations in fish tissue were from the area of Brookneal, with the highest

concentration being 80 ppm. None of the sediment samples collected in the same area reported a PCB concentration greater than 1 ppm.

- **Summer 1987** EPA collected fish tissue samples from the Roanoke (Staunton) River near Altavista, Brookneal and Clover, Va. The highest PCB concentration (3.4 ppm) was from fish collected in the Altavista area.
- **Fall 1990** DEQ collected fish tissue samples from the Roanoke (Staunton) River near Altavista and Brookneal. The highest PCB concentration (0.69 ppm) was from fish collected in the Brookneal area.
- **Summer 1991** DEQ collected fish tissue samples from the Roanoke (Staunton) River near Hardy, Brookneal and Clover. The highest PCB concentration (1.92 ppm) was from fish collected in the Clover area.
- **1993** Roanoke River basin study by the DEQ. The highest concentration of PCB in fish tissue was 2.72 ppm collected in the Long Island area. Fourteen sites were sampled from the upper Roanoke to Lake Gaston including one site on the Dan River.
- **October 1996** DEQ publishes “1993 Roanoke River Basin Study; Assessment of polychlorinated biphenyls and organochlorinated pesticides contamination in fish tissue.”
- **July 24, 1998** The Virginia Department of Health issued a fish eating advisory for striped bass, white bass and carp in 50 miles of the Roanoke (Staunton) River. The advisory was from the mouth of Seneca Creek at Route 704 near Long Island, downstream to where a pipeline intersects Route 803 in Halifax County and where Route 633 in Charlotte County crosses the river.
- **August 20, 1998** Virginia Department of Health and DEQ staff attended a public meeting in Brookneal, sponsored by Delegate Bennett and Senator Hawkins, to explain the fish consumption advisory and describe the DEQ PCB data and study proposal.
- **October 8, 1999** DEQ and Health Department officials attended a public meeting with the Staunton River Citizen Advisory Committee to outline the proposed plan for re-evaluation of the Roanoke (Staunton) River PCB contamination.
- **October 20, 1998** Roanoke (Staunton) River PCB work plan posted on the DEQ web site.
- **Fall 1998** Fish tissue and sediment sampling in the Roanoke (Staunton) River Basin was completed at seven sites. Eight fish tissue samples showed elevated concentrations of PCBs above the Virginia Health Department's 600 ppb level of concern.

- **Fall 1998** Sediment samples collected from the Roanoke (Staunton) River and Kerr Reservoir. Laboratory results posted to the DEQ web site June 2, 1999.
- **Spring 1999** Fish tissue samples collected from the Roanoke (Staunton) River near Clover and the Dan River in South Boston. Laboratory results posted on the DEQ web site December 10, 1999.
- **Spring 1999** Roanoke (Staunton) River fish tissue and sediments collected. Fish physical data posted on the DEQ web site July 13, 1999 and laboratory results posted December 10, 1999.
- **May 17, 1999** DEQ PCB Source Search Team formed: Central Office, West Central Regional Office, & Piedmont Regional Office.
- **March 26, 1999** Virginia Department of Health expanded the fish species list for the Roanoke (Staunton) River advisory area to include smallmouth bass, channel catfish and flathead catfish.
- **April 20, 1999** DEQ attended a public meeting with the Staunton River Citizen Advisory Committee to discuss the March 26, 1999 health advisory.
- **April 29, 1999** DEQ posts update on the Roanoke (Staunton) River PCBs and toxics database on its web site. The update addressed information gathered in the 1993 study.
- **June 2, 1999** DEQ posts fish tissue data summary in two reports, one listed by fish species, the other by sampling station.
- **June 2–3, 1999** Brookneal follow-up sediment collection. Sample locations posted on the DEQ web site July 13, 1999 and laboratory results posted on August 25, 1999. Highest PCB concentration measured was 2,730 ppb in a sediment sample collected downstream from Tanyard Branch.
- **July 7, 1999** DEQ met with BGF Industries for an interview and tour of site locations related to PCB use. DEQ met with Lane Furniture to establish the locations of two abandoned landfills in Altavista.
- **July 15, 1999** Project plan and costs approved for PCB Source Search Team.
- **August 11, 1999** Sediment monitoring station locations posted on the DEQ web site.
- **August 26, 1999** Interview & inspection at Burlington Industries, Hurt, Va.
- **September 1, 1999** Letter from U.S. Senator John Warner to EPA Region III regarding PCBs in the Roanoke (Staunton) River; contained EPA database search results.

- **October 7, 1999** Soil, water, and sediment samples collected at the BGF facility in Altavista. Laboratory results posted on the DEQ web site December 2, 1999.
- **December 1, 1999** DEQ met with BGF personnel to explain soil, water and sediment sample results.
- **December 2, 1999** DEQ Director Dennis H. Treacy ordered BGF to immediately stop any discharge of PCBs to the Staunton R.
- **December 2, 1999** Virginia Department of Health extended the Roanoke (Staunton) River health advisory 29 miles to the Leesville Dam based on DEQ sample results at the BGF facility.
- **December 8, 1999** DEQ interviewed three oil distributors in Altavista to determine the past uses and consumers of PCB products in the area.
- **December 10, 1999** DEQ publishes final report on the October 7, 1999 BGF facility sampling.
- **December 15, 1999** Joint EPA and DEQ interview and site inspection of BGF Industries and Lane Furniture Company, Altavista.
- **December 21, 1999** DEQ met with representatives of Campbell Co., Pittsylvania Co., Altavista STP, Altavista Town Council, Staunton River Watch, Staunton River PCB Advisory Committee, Altavista Journal, BGF, ATC Inc. (environmental consultant for BGF), and the Mayor of Altavista. The meeting addressed environmental remediation objectives at the BGF facility.
- **August 3, 2000** DEQ/BGF met at BGF to review PCB data collected by BGF contractor (ATC Associates, Inc.) on BGF property and adjacent storm water tributary leading off the property.
- **August 22, 2000** DEQ completes a summary report comparing the 1998-1999 PCB fish tissue data to 1997 and 1993 data.
- **Post 2000** BGF met the federal Toxic Substances Control Act (TSCA) requirements and DEQ turned the remediation project over to EPA for clean-up. Town of Altavista participated in Voluntary Remediation Program. Effluent survey conducted on permitted discharges to the Roanoke and tributaries in the study zone.

***TMDL Activities:*** In order to address endangered species concerns in the Roanoke River basin, EPA Region III is funding a TMDL development project for PCB advisory areas downstream of Leesville Dam. EPA is currently soliciting proposals on this work.

- **Kerr Reservoir within the state of Virginia from the confluence of Dan River and Roanoke River to John H. Kerr Dam including its tributaries Eastland Creek and Nutbush Creek (within the state of Virginia)**

***Fish and sediment monitoring:*** conducted in this watershed in special studies 1993 and 1998, follow up 1999 and 2002. Previous sampling: 1994, 1989, 1987, 1985, 1983, 1979, special studies 1971

## **CHOWAN RIVER BASIN**

- **Meherrin River from below Emporia Dam downstream to the Rt. 730 bridge**

***Fish and sediment monitoring:*** conducted in this watershed in 1996 and follow up 2002.

## **TENNESSEE RIVER BASIN**

- **Guest River from Rt. 23 near Esserville downstream to the confluence with Clinch River including its tributary Bear Creek up to the confluence with Yellow Creek**

***Fish and sediment monitoring:*** conducted in this watershed in 1997, follow up 2002 and special study 2003. Previous sampling: 1991

### ***Source assessment:***

Enlisted input from Stakeholders

1. Investigated historic industrial sites with stakeholders (TVA, VDH, Guest River Watershed Group, Lonesome Pine Soil and Water Conservation District, Department of Mines, Minerals, and Energy, coal mining company/laboratory doing sampling NPDES reporting in the watershed, local paper search, discussion with Carol Fields - reporter regional historian, county courthouse records online search, EPA online records search ); Summer, Fall 03
2. Talked to reporters about the issues and public concerns about the watershed. Articles appeared in newspaper and coverage on TV news, Summer 04
3. Reviewed illegal dumpsite and potential contamination areas from watershed drainage area with TVA and GRWG (Guest River Watershed Group) personnel.

Source Assessment

1. Reviewed PREP complaint records in SWRO for the watershed since 1970s.
2. Made recommendations about sampling locations and assisted with CO, TVA, and Spectrum Labs personnel with follow-up segmented watershed fish tissue and sediment sampling to determine extent of PCB contamination upstream of confluence with Clinch River, Fall 03.
3. Request groundwater data from DMME, based on their regulation of the coal mining industry.
4. Reviewed illegal dumpsite and potential contamination areas from watershed drainage area with TVA and GRWG (Guest River Watershed Group) personnel.
5. Presented PCB concerns and data at TMDL meeting for bacteria and benthic impaired segment, with GRWG (Jan. 26, 2004).
6. Review data from items 2 and 3 and follow-up with further sampling or actions or appropriate agencies for cleanup.
7. Plan to obtain list of industries and contacts upstream of the Bangor Community from the towns, Wise County, Chamber(s) of Commerce, and GRWG.
8. Plan to contact industry personnel and use survey form to inquire about PCB usage.
9. Plan to meet with the industries as a group in a separate meeting on the day of the final TMDL meeting, Summer or Fall 04.
10. Plan PCB sediment sampling from industrial sites, if necessary (VEERF or EPA).

➤ **Stock Creek from Rt. 650 bridge above Natural Tunnel downstream to the confluence with Clinch River near Clinchport**

*Fish and sediment monitoring:* conducted in this watershed in 2002.

*Source assessment:*

1. Noted that the 2004 305b would list segment above DEQ screening level of 54 ppb PCBs for trout 12/03.
2. Researched PCBs in trout and found research done by Pennsylvania DEP on PCB in fish contaminated by feeding with trout feed.
3. Contacted DGIF to discuss PCB in trout 12/03. Discussed issues with PCBs in hatchery raised trout with DGIF, state hatchery manager and hatchery managers at Marion and Wytheville. Provided references to the Pennsylvania studies.
4. Sampled Fish Hatcheries; Marion & Wytheville Trout Hatcheries to determine impact of least expensive fish food on stocked trout PCB concentrations (Jan. 27, 2004).
5. Received informal notification that all stocked fish data indicated low levels that were not the source of the fish contamination problems in Stock Creek (July 2004).

➤ **Wolf Creek from Rt. 670 near Abingdon downstream to Rt. 75 near Green Spring**



***Fish and sediment monitoring:*** conducted in this watershed in 1997 and follow up 2002.

➤ **Beaver Creek from Beaver Creek Dam downstream to the VA/TN state line within the city of Bristol**

***Fish and sediment monitoring:*** conducted in this watershed in 2002 and follow up and special study 2004.

***Source assessment:***

Initiated coordination with Tennessee Department of Environmental Control

1. Contacted TN TDEC (TMDL group) to discuss TN data on Beaver Creek. Shared data with TN. TDEC attended the TMDL meetings and became an active partner in the TMDL process, early 2003.

Enlisted input from Stakeholders during the benthic and bacterial TMDL process

1. Developed and distributed TMDL newsletter for the bacteria and benthic impaired segment, informed public of PCB issue and announced the PCB discussion and source identification phase to be held during the TMDL meeting, June 25, 2003.
2. Held first public meeting June 25, 2003 for TMDL bacteria and benthic segment. Informed public of PCB issue. Public concerned. Public concerned that the stream was not posted. Public provided suspected PCB sources in watershed.
3. Talked to reporters about the issues and public concerns about the watershed. Coverage on the TV news, June 2003.
4. Visited historic industrial sites with stakeholders, June 2003.
5. Contacted VDH concerning posting of the stream. Although a VDH fish consumption advisory had been issued in May, no signs had been posted yet.
6. As a result of the public concern, VDH posted signs warning public about PCB advisory 9/03.
7. Reviewed PREP complaint records in SWRO for the watershed since 1970s, Summer 2003.
8. Contacted EPA and received one Superfund PCB cleanup report in watershed, Fall 2003.
9. Contacted local historian and stakeholders about historical industries in watershed, Fall 2003.
10. Presented PCB concerns, data, and Sampling plans at final TMDL meeting with Beaver Creek Watershed group (Feb. 11, 2004). Report to stakeholders and gather additional information. Developed contact list for PCB issues amongst interested stakeholders.
11. Visited and contacted industry representatives, used survey forms and obtained maps of PCB related activities or visited sites to inquire about PCB usage, 2/04 to 8/04.

12. Met with BVFD, Bristol Virginia Fire Department, (Peggy Brown), to review reports of transformer explosions, railyard incidents, or HAZMAT responses involving PCB oils and equipment, Winter 2003.
13. Distributed Surveys in Beaver Creek watershed, contacted Boone Lake Watershed group, attendees to the Beaver Creek TMDL meeting PCB mailing list (July 2004).
14. Contacted Bristol Virginia Utilities Board (Buddy Snodgrass, PE -- Vice President Operations; and Allen Leonard, Environmental and Safety coordinator) regarding existing transformers in vaults underground, incidents involving PCBs, and maps of electrical supply facilities and operations (included Bristol, VA and TN) , Summer 2004.
15. Met with Bristol Virginia Assistant City Manager (Bill Dennison and Staff) received digitized aerial view maps of roads, drains, water routes, and facilities in the city limits. Discussed sampling plans and Brownfields applications (potential benefits of sampling to Bristol, VA) involving PCBs and historic PCB events (July 30, 2004).
16. Design sampling plan for PCB fish and sediment sampling based on source ID work. Summer 2004.
17. Obtained permissions from property and business owners and operators in watershed to sample sediments and soils in Beaver Creek watershed, Summer 2004.
18. Requested and obtained fish permit from TN EAC (TDEC Nashville, TN), Summer 2004
19. Coordinated sampling with local TN DEC EAC office of Johnson City, TN.
20. Sampled Beaver Creek watershed, including Little Creek, mainstem Beaver Creek, and Sinking Creek for fish tissue and sediments at request of VDH to help determine the extent and potential locations of contamination. (August 9-13, 2004).
21. Designed sampling plan for sediment sampling with EPA (VA region 3 OSC Perry Gaughan) and contractor; coordinate with TN DEC (possibly USEPA Region 4 OSC) to be conducted September 2004.
22. Review data from items 20 and 21 and follow-up with appropriate agencies for cleanup.

Report of PCB investigation --dependent upon timeframes needed for data to be returned from laboratory for 20 and 21. Summer 2005

***Remediation at EPA Removal Facility:*** The Twin City Iron and Metal site of Bristol, VA (aka VA-383; closure report EPA Docket No. III-95-45-DC) was a scrap metal reclamation yard where PCB oil storage container discharged between 500 and 5000 gallons on the streambank of Beaver Creek. The spill was responded to quickly by state and federal emergency personnel. Soil was evaluated, removed, transported, and approximately 132 tons of PCB and lead contaminated soil were disposed of at a Johnson City, TN hazardous waste facility. During the cleanup, the site was excavated and tested to the level of a historic pre-RCRA underlying town dump, which was then covered by several feet of a crushed limestone cap.

## **BIG SANDY RIVER BASIN**

### **➤ Knox Creek from the VA/KY state line upstream to its headwaters near the VA/WV state line including its tributaries**

Fish and sediment monitoring: conducted in this watershed in 1997, follow up 2002, special studies 2003 and 2004. Previous sampling: 1991

#### ***Source Assessment:***

Enlisted input from Stakeholders

1. Contacted Big Sandy Watershed representative and Soil and Water Conservation District personnel regarding potential sources for PCB contamination.
2. Received calls from public requesting sampling for trout stocking event at children's fishing rodeo on VDH listed section of watershed (previously unsampled upper reach. Referred them to Citizens Sampling Request form and DEQ Citizen Monitoring Coordinator, Joyce Brooks, Richmond.
3. Met with coal industry representative 9/03 to discuss possible sources in watershed since coal is the main industry in these watersheds.
4. Reviewed historical data from sampling events at the Levisa Fork and Knox Creek Watersheds.
5. Helped design and assisted fish tissue and sediment sampling of Knox Creek upper reach for watershed group and local citizens, when scheduled by DEQ-CO. Performed visual site surveys for follow-up downstream sampling with local watershed group personnel.
6. Assisted with DEQ extensive fish tissue and sediment sampling of the Knox Creek watershed for PCBs (August 30-Sept 3, 2004).
7. Contacted the KY fish tissue folks and found that they have just completed fish tissue collection on both streams in KY. Provided them with DEQ data and they promised to share theirs when available. KY does not have PCB advisories on the stream yet.
8. Contact State of KY TMDL representatives to begin discussion of PCBs in Levisa and Knox across state lines, 2005.
9. Begin the PCB more extensive source investigation in conjunction with the fecal and benthic TMDL to start Knox Creek 2005 and Levisa Fork 2006

### **➤ Levisa Fork River from the confluence with Slate Creek at Grundy to the State line**

***Fish and sediment monitoring:*** conducted in this watershed in 1997, special study 2000 and follow up 2002. Previous sampling: follow ups 1991, 1990, 1989, special study 1987, 1986, 1985, 1983, 1981, 1979

PCBs were initially reported in fish tissue samples collected from the Levisa Fork near the VA/KY state line in 1985. PCB had not been detected in previous samples collected

by the Virginia State Water Control Board (SWCB) monitoring CORE program in 1981 and 1983. Elevated PCB levels at or above the FDA action level were confirmed in 1986. A 1987 special study documented the presence of PCB in fish tissue samples near the state line. Additional sampling were conducted in 1997 and 2002. Another intensive monitoring was conducted in 2000.

*Source Assessment:* See Knox Creek entry.

- **Levisa Fork River from confluence with Slate Creek upstream to the confluence with Contrary Creek (intersection of Rt. 460 and Rt. 680) including its tributary Garden Creek up to the confluence with Right Fork of Garden Creek (intersection of Rt. 624 and Rt. 632).**

*Fish and sediment monitoring:* conducted in Levisa Fork in 1997, special study 2000 and follow up 2002. Previous sampling: 1991, special study 1987. Garden Creek was also sampled in 1997 and follow up 2002.

*Source Assessment:* See Knox Creek entry

## **CHESAPEAKE BAY, ATLANTIC OCEAN, AND SMALL COASTAL RIVER BASIN**

- **Lake Trashmore (entire lake), Virginia Beach**

*Fish and sediment monitoring:* conducted in this watershed in 1998 and follow up 2003.

- **Lake Whitehurst (entire lake), Virginia Beach**

*Fish and Sediment monitoring:* conducted in this watershed in 1998 and follow up 2003.

- **Little Creek near US Naval Reservation Little Creek Amphibious Base**

*Fish and sediment monitoring:* conducted in this watershed in 1998 and follow up 2003.

- **Mainstem Chesapeake Bay and its small coastal tidal tributaries**

*Fish and sediment monitoring:* conducted in this watershed in 2003. Previous sampling: 1994 striped bass collected near the mouth of the Rappahannock River

➤ **Eastern Branch Lynnhaven River, Virginia Beach**

***Fish and sediment monitoring:*** conducted in this watershed in 1998 and follow up 2003.

➤ **Mobjack Bay and tributaries particularly East River, North River and Ware River**

***Fish and Sediment monitoring:*** conducted in this watershed in 1998 and follow up 2003.

➤ **Tabbs Creek (entire creek) near Langley Air Force Base, a tributary of Northwest Branch Back River**

***Fish and sediment monitoring:*** conducted in this watershed in 2003. Previous sampling: 1998 Northwest Branch Back River

***Remediation at Federal Facility:*** In the summer of 2000 a removal action for PCBs and PCTs was completed in Tabbs Creek at the NASA Langley facility. The cleanup goal was 5 ppm PCBs to provide long term protectiveness of both human health and the environment. The cleanup involved the removal of approximately 10,500 cubic yards of contaminated sediments of which 3,600 cubic yards were sent to a TSCA regulated disposal site. The removal took approximately eight months to accomplish and cost 5.5 million dollars. The wetland vegetation and biota are being monitored to ensure the remedial action is successful.

## **YORK RIVER BASIN**

➤ **York River from West Point downstream to the mouth near Tue Point and tidal portion of the following tributaries: King Creek, Queen Creek and Wormley Creek**

***Fish and sediment monitoring:*** conducted in this watershed in 1995, 1996, 2000 and follow up 2003. Previous sampling: 1994, 1993, 1990, 1987, 1984, 1982, 1981, 1980, 1979

***Remediation at Federal Facility:*** Camp Peary has conducted PCB removal actions at three locations. The PCB concentrations generally ranged from 50 to 100 ppm. At the first site, approximately 665 cubic yards of PCB contaminated soil was removed. At the second site approximately 1,430 cubic yards of contaminated soil was removed and at the third site approximately 2,700 cubic yards of contaminated soil were removed.

***Remediation at Federal Facility:*** Site 5 at the Yorktown Naval Weapons Station, also known as a transformer storage area, was investigated for PCB contamination in the early

1990's. A removal of contaminated soils was performed and a Record of Decision was signed in 1995 stipulating No Further Action. Sampling had confirmed that all residual contamination had been removed and the site was "clean closed".

***Remediation at Superfund Facility:*** At the HH Burn Pit site, 4,361 tons of PCB and lead contaminated soil were removed from the burn pit area in 1998. Also, 1,063 tons of PCB and heavy metal contaminated soil was removed from the surface water channel in 1999. All of the soil was transported off site with the most contaminated soil transported to New York. PCB concentrations ranged up to 1,200 ppm.

➤ **Lake Anna (entire lake) including its tributaries Terry's Run, Goldmine Creek and Contrary Creek**

***Fish and sediment monitoring:*** conducted in this watershed in 1994, 2000 and follow up **2003**. Previous sampling: 1994

***Source Assessment:*** DEQ is collaborating with the Lake Anna Civic Association on study design for contaminant analysis of sediment and water concentrated via deployment of semi-permeable membrane devices.

Lake Anna is located in central Virginia, 25 miles southwest of Fredericksburg and 60 miles northwest of Richmond. (Figure 1) The lake is located in Louisa, Orange and Spotsylvania counties and is comprised of the former North Anna River and several tributaries (Figure 1).

In 1972, Virginia Electric and Power Company , now Dominion Virginia Power, impounded the North Anna River creating Lake Anna, a 17-mile long, 9600-acre (3885 hectare) reservoir. Lake Anna provides condenser cooling water for the North Anna Nuclear Power Station. Adjoining Lake Anna is a 3400-acre (1376 hectare) Waste Heat Treatment Facility (WHTF). The WHTF receives cooling water and transfers the excess heat from the cooling water to the atmosphere prior to discharge into the lower lake, near the dam.

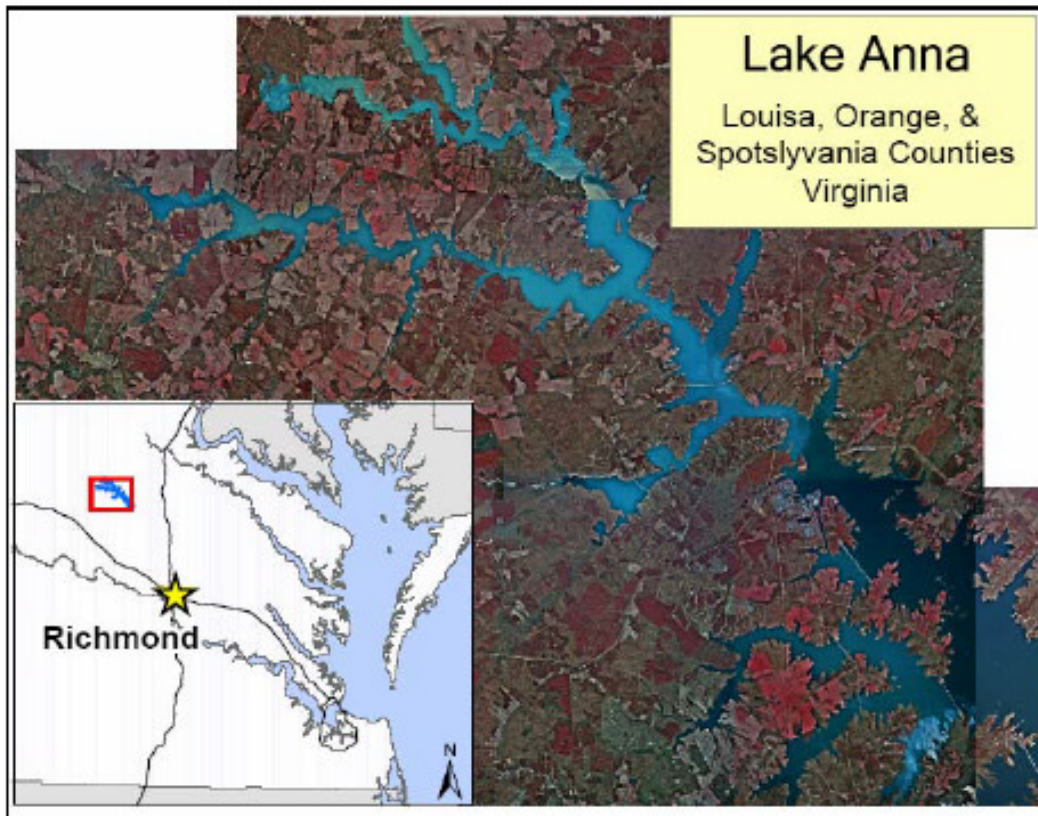


Figure 1 – Lake Anna Location

Three sections of Lake Anna are included in the 2004 §303(d) Report on Impaired Waters due to the presence of polychlorinated biphenyls (PCBs) in fish tissue at concentrations not supporting the fish consumption beneficial use. These sections are:

- Lake Anna lower portion, beginning near the northern end of the Route 690 bridge downstream to the dam
- The Contrary Creek arm of Lake Anna;
- The Gold Mine Creek arm of Lake Anna.

Additional fish tissue sampling conducted by the Virginia Department of Environmental Quality in 2003 revealed PCB concentrations in tissue from fish located in other parts of Lake Anna, with the highest concentrations found in Terry's Run. As a result, the Virginia Department of Health issued a fish consumption advisory for carp caught in Lake Anna.

In addition to the PCBs found in fish tissue, historical mining activities along Contrary Creek raise concern about potential harmful water quality impacts to the Lake. Current and historical data indicate acid mine drainage is impacting the free-flowing portion of Contrary Creek.

As a result of the 303(d) listing of impaired waters and the potential for metals contamination from the mining activities, a federal appropriation was granted through

§206 of the Water Resources Development Act of 1996 to undertake a Preliminary Restoration Plan, or Feasibility Study, for Lake Anna. Phase I of the study included sediment sampling throughout the lake and in free-flowing tributaries. Phase II of the study will entail water column analysis through the use of semi-permeable membrane devices (SPMD). As of the writing of this project summary, the SPMD's have not yet been deployed. This study is being conducted in cooperation with the U.S. Army Corps of Engineers Norfolk District, the Virginia Department of Environmental Quality, and the Lake Anna Civic Association.

## Project Overview

The feasibility study was designed to identify potential 'hot' spots, or contaminated regions, in Lake Anna for further investigation in subsequent project phases. The monitoring plan was developed with two primary considerations. First, there was no clear source of PCB contamination for the lake; the entire lake needed to be evaluated for possible sources. Second, \$100,000 of federal funds were appropriated for the project. Of this total appropriation, approximately two-thirds was available for direct expenditures such as laboratory analytical costs and supplies. The sampling plan was developed recognizing the allocated budget. All field sampling was conducted by the VADEQ, Northern Virginia Regional Office (NVRO).

### Phase I Sediment Sampling

The Phase I analysis divided the lake into seven (7) segments, or strata, based on lake morphology and the location of the nuclear power plant intake pumps. Each strata was then divided into sections. Composite sediment samples were collected from each of the sections. In addition, sediment samples were collected from four of the tributaries to Lake Anna in the free-flowing portion of each stream. Finally, a sediment sample was collected from the North Anna River downstream from the dam. Table 1 describes the lake segments and Figure 2 graphically presents the lake strata.

Table 1. Lake Anna Sampling Locations

Segment		Description	Number of Sections
1	North Anna River (lower)	Bordered by Route 208 to the northwest and the Lake Anna dam to the southeast	4
2	Contrary Creek	Beginning 1.25 miles west of Route 652 to the confluence with Lake Anna (lower) segment	3
3	Pamunkey Creek	Headwaters of the lake to the confluence with the North Anna River Segment	4
4	Terry's Run	Headwaters of the lake to the confluence with the Pamunkey Creek segment	6
5	North Anna River (upper)	Headwaters of the lake to the confluence with the Pamunkey segment of the lake	3
6	Gold Mine Creek	Headwaters of the lake to the confluence with the North Anna (upper) segment.	1
7	Pigeon Run/North Anna River (middle)	Below the confluence of Pamunkey Creek segment and the Lake Anna (upper) segment to the Route 208 bridge	3
8	Free Flowing Streams	Contrary Creek, Goldmine Creek, Terrys Run, Pigeon Run and North Anna River below dam.	N/A



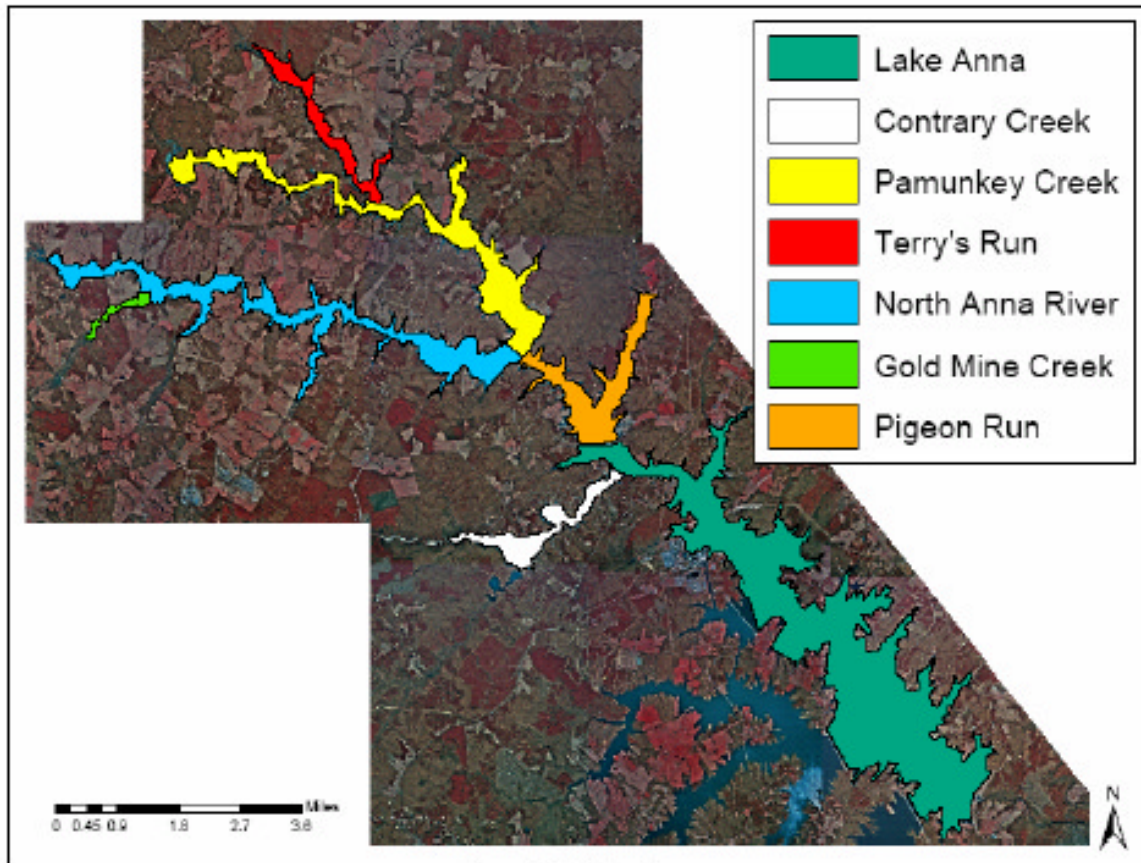


Figure 2 – Lake Anna

VADEQ, NVRO initiated the sediment sampling on August 1, 2004. The sampling was completed on August 10, 2004, with the sampling of the free-flowing streams. All sampling was conducted in accordance with the Field Sampling Plan and Quality Assurance Project Plan. Both of these documents are dated July 30, 2004, and are available for review upon request.

Twenty-three (23) composite samples and five (4) grab samples were collected from the strata locations within the lake and analyzed using the following methods:

SW-846 Method 8082 for PCBs  
SW-846 Method 6010B for Priority Pollutant Metals  
SW-846 Method 7471A for Mercury

Additionally, ten (10) samples are currently being analyzed using EPA Method 1668A for PCB congeners. EPA Method 1668A is used for determination of the 209 chlorinated biphenyl congeners using high resolution gas chromatography/high resolution mass spectrometry. Due to budget limitations, the Method 1668A analyses were restricted to a selected number of samples.

The primary analytical laboratory for this sampling event was Accutest Laboratories (Accutest). Analytical services for EPA Method 1668A were provided by Paradigm Laboratory as a subcontractor to Accutest.

Accutest and Paradigm are both certified by the U.S. Army Corps of Engineers (USACE) to perform all the primary chemical analyses required by this project. The quality assurance (QA) analytical laboratory for this sampling event was Severn Trent Laboratories (STL)). STL is also certified by the USACE to perform all the QA chemical analyses required by this project. All participating laboratories were responsible for providing shipment coolers, sample containers, sample labels, deionized water, temperature blanks, Chain-of-Custody (COC) documentation, and analytical services for their respective responsibilities.

### **Sediment PCB Test Results**

Test results are available for PCBs analyzed using SW-846 Method 8082. This method is appropriate for determining concentrations of polychlorinated biphenyls as Aroclors and may be used to determine concentrations of 19 individual PCB congeners. The method detection limits for each Aroclor are listed below in Table 3.

Table 3. SW-846 Method 8082 Detection Limits

Compound	Method Detection Limit (MDL, ug/kg)	Reporting Limit (RL, ug/kg)
Aroclor 1016	6.7	17
Aroclor 1221	4.4	17
Aroclor 1232	6	17
Aroclor 1242	7.1	17
Aroclor 1248	1.4	17
Aroclor 1254	2.9	17
Aroclor 1260	6.2	17

All PCBs concentrations using Method 8082 were reported as below detection limits. This indicates that the SW-846 8082 methodology is not sufficiently sensitive to measure PCBs at the levels needed in this type of ambient application where there are no known 'hot' sources of contamination. Additionally, this methodology is not appropriate where Aroclors have been weathered by long exposure in the environment.

The results of the EPA Method 1668A analyses are forthcoming. This methodology is capable of measuring individual congener concentrations at the ng/kg level and should be able to better identify and distinguish PCB contaminants.

## Phase II Water Column Monitoring

The concentration of PCBs in the water column at Lake Anna will be determined using semi-permeable membrane devices (SPMDs). Scientists at the USGS's Columbia Environmental Research Center (CERC) developed lipid-containing SPMDs to replace standard fish tissue analysis. They are designed to mimic key aspects of the bio concentration process, which results in elevated contaminant concentrations in organism tissues after exposure to trace hydrophobic organic contaminants in aquatic environments. Use of lipid-containing SPMDs, permits the passive sampling of a broad spectrum of trace contaminants ranging from small, more water-soluble compounds such as naphthalene and tributyltin, to large very hydrophobic compounds such as brominated diphenylethers. Sampling of compounds with moderate to high Kows is integrative (i.e., extracted residues are constantly accumulated without significant losses back into the environment) and analyte concentrations are reported as time weighted average (TWA) values. Models and calibration data are available for the derivation of aqueous contaminant concentrations from SPMD concentrations. Based on recent work on the use of permeability/performance reference (PRCs) compounds in exposed SPMDs, the accuracy of SPMD derived water concentration estimates should be within two fold of actual concentrations. These advances in SPMD technology have resulted in the worldwide application of SPMDs to monitoring organic pollutants in aquatic environments.

A total of ten (10) SPMDs will be deployed under the water column assessment phase of this project. One SPMD will be deployed in each of the seven strata of Lake Anna as depicted in Figure 2. Additional SPMD locations include: (1) one in the Waste Heat Treatment Facility waters; (2) one in the North Anna River downstream from the dam; (3) one in free-flowing waters of Terrys Run.

The plan is to deploy the SPMDs in early October 2004 and retrieve the devices approximately 28 days after deployment. The SPMDs will be analyzed for the 209 PCB congeners by the Columbia Environmental Research Center U.S. Geological Survey. Method detection limits for individual congeners is approximately 0.05 ng and 3.0 ng for the sum total of all congeners. The final analytical data report from CERC is expected approximately six (6) months after sample retrieval.

- **Mattaponi River from the confluence with Herring Creek (Rt. 600 close to river near Herring Creek Mill) downstream to the confluence with Aylett Creek (Rt. 600 close to river at Aylett Mill)**

***Fish and sediment monitoring:*** conducted in this watershed in 1996 and follow up 2003. Previous sampling: 1994

## **NEW RIVER BASIN**

➤ **New River from below Claytor Lake Dam downstream to the VA/WV state line near the town of Glen Lyn in Giles County, VA**

***Fish and Sediment monitoring:*** conducted in this watershed in 2000, follow up special studies 2001, 2002 and follow up 2004. Previous sampling: 1990, 1988, 1986, 1985, 1983, 1981, 1980, 1979

***Source Assessment:*** Summary of the New River PCB Study

On August 6, 2001, the Virginia Department of Health (VDH) issued a fish consumption advisory for carp taken from the New River between the Route 114 bridge (Peppers Ferry Boulevard) just north of Radford to the Virginia-West Virginia state line near Glen Lyn. Based on these findings and the posting of the fish consumption advisory, DEQ initiated the New River PCB Source Investigation project in accordance with DEQ's Toxic Contamination Source Assessment Policy (TCSAP, Jan. 5, 2000), which describes when and how to conduct source assessments for toxic contaminants.

Following the issuance of the advisory, the New River PCB Source Search Citizen's Committee (Committee) was formed to advise DEQ about the direction and substance of the investigation, communicating information to the public, and providing local information and perspectives critical to the success of the project. Committee members work or live in the affected advisory area. The Committee was the primary conduit through which DEQ communicated with the public. DEQ staff met with Committee members on six occasions between April 25, 2002, and May 27, 2004. All meetings were advertised in the local newspaper (Virginia Register) and with paper and electronic mailings. All meetings were open to the public. The Department of Game and Inland Fisheries and Virginia Department of Health were also advised of all meetings.

In 2002 DEQ staff in Central Office and West Central Regional office collected additional fish tissue and sediment data from the New River and major tributaries to try and pinpoint the source(s) of PCBs. In 2003 the DEQ West Central Regional Staff used this information to develop a systematic approach to locating sites that may be contributing PCBs to the New River.

In order to identify potential PCB sources in the New River, industrial facilities that may have used or stored PCB containing substances were identified. The potential to have used or stored PCBs was determined based on a review of agency records, historical information, and pre-existing analytical results, as well as by discussions with Committee members and interviews with representatives of industrial and municipal facilities. Soil and sediment samples were collected from certain industrial and municipal facilities that were found to have used or stored PCBs historically, and had a potential to release PCBs to the New River. The facilities selected for sampling and sample locations were reviewed with the Committee.

The potential to have released PCBs was determined through a multi-step process. The first step was to define the universe of facilities that operated currently or historically

within the New River watershed downstream of the Claytor Lake Dam. In order to generate such a comprehensive list, multisystem data queries were performed based on location (county, water body identification, zip code, etc.) for air, water, solid waste, petroleum, Virginia Voluntary Remediation Program (VRP), and tire sites. Facility lists for each media and facility type were created and maintained separately. Following list synthesis, file searches of agency records were performed to determine the facility location, type of industrial operation, and other relevant site-specific information. The initial facility list contained approximately 1,350 facilities.

Due to the large number of facilities initially inventoried, it was necessary to develop a discrete set of criteria that could be applied to the list in order to focus search efforts on higher probability PCB sources. Facilities that did not meet a potential PCB source criterion were removed from the list. After screening facility information against selection criteria, then combining the air, water, and waste media lists, and eliminating duplicate facility entries, approximately 80 facilities remained on the potential PCB source list. The New River PCB Source Investigation Survey was mailed to the 80 facilities remaining on the potential source list. The survey results were reviewed, in combination with telephone or on-site interviews, to further refine potential facilities that may warrant on-site sampling. Interviews and additional site inspections were used to select 17 facilities and 2 streams for soil and sediment sampling. Analysis of the samples indicated the following conclusions:

1. All samples contained some quantified level of PCBs. This is due, in part, to the low quantification levels being achieved. The presence of PCBs in a sample at a very low concentration does not indicate a site poses a risk to public health or water quality.
2. No major, ongoing sources of PCBs to the New River were identified. The Holston River Quarry site contained greater than 50 ppm total PCBs, but it does not appear that the site is a major ongoing source of PCBs to New River. EPA was immediately notified of the sample result and the site owner is working with EPA to remediate the site.
3. Certain facilities appear to have residual concentrations of PCBs present on-site. These levels are less than 50 ppm, but appear to be higher than a "background" level. Facilities may warrant further investigation based upon the PCB levels detected and include American Electric Power, Internet, Radford Army Ammunition Plant, Bane School, and Cloyds Mountain Landfill.
4. Sediment data from Walker Creek at River Mile 4.34 (7.64 ppm) and Sugar Run below Bane School (7.72 ppm) appear to be very high for an in-stream sediment concentration. Fish tissue collections should include Walker Creek, especially between River Mile 4.34 and 17.14. Repeat sampling of stream sediment in Walker Creek at station 4.34 and Sugar Run below Bane School is also warranted.
5. DEQ is currently evaluating a statewide approach for evaluating and managing streams and facilities where PCBs have been detected. The statewide approach may

address specific levels of PCBs in soil and sediment that should be further investigated to minimize the potential for further releases of PCBs to state waters.

6. Substances containing PCBs, such as Aroclors, are mixtures of different PCB congeners. Determination of PCBs in environmental samples should use individual PCB congeners as standards, as opposed to Aroclors, to account for weathering that may have altered the chemical signature of PCBs released to the environment for an extended period of time. In the course of this investigation, samples analyzed for Aroclors were often reported as "non-detectable," when the congener analysis resulted in the detection of PCBs in the same sample in the parts per million range.

A report entitled "New River PCB Source Identification Sample Collections and Analytical Results" was completed in 2004.

- **New River/Claytor Lake from the Rt. 77 bridge near Jackson Ferry downstream to Claytor Lake Dam including its tributaries Peak Creek up to the confluence with North Fork Peak Creek (Tract Fork) in Pulaski and Reed Creek up to the confluence with Miller near Rt. 121 bridge near Max Meadows**

***Fish and sediment monitoring:*** conducted in this watershed in 2000 and follow up 2004. Previous sampling: 1987

- **Bluestone River from the Rt. 460 bridge just south of Bluefield, VA downstream to VA/WV state line near the town of Yards in Tazewell County, VA**

***Fish and sediment monitoring:*** conducted in this watershed in 2000, follow up special studies 2002 and 2003.

#### ***Source Assessment Activities by DEQ:***

Initiated coordination with West Virginia Department of Environmental Protection

1. Contacted WV TMDL to discuss DEQ PCB data and inquire about any WV PCB data from the Bluestone. Shared DEQ PCB data with WV, Summer 2003. WV DEP attended the TMDL meetings and became an active partner in the PCB source assessment work.

Enlisted input from Stakeholders during the benthic and bacterial TMDL process

1. TMDL fecal and benthic announcement in Virginia Register, informed public of PCB issue and announced the PCB discussion and source identification phase to be held during the TMDL meeting, September 11, 2003.

2. TMDL newsletter for the bacteria and benthic impaired segment, informed public of PCB issue and announced the PCB discussion and source identification phase to be held during the TMDL meeting, September 11, 2003.
3. First public meeting September 11, 2003 for Bluestone TMDL, bacteria and benthic segment. Informed public of PCB issue. Public and VDH concerned about the Town WTP in the PCB segment. Public provided suspected PCB sources in watershed.
4. Talked to reporters about the issues and public concerns. Newspaper article followed, September 2003.
5. Held second PCB public meeting for Bluestone River PCB impairment to address public exposure concerns from previous TMDL meeting, including a special presentation coordinated with VDH, Charles Rest and town of Bluestone, Todd Miller (March 18, 2004).
6. Attended and presented status of PCBs assessment at Bluestone River Watershed group startup meeting, (July 22, 2004).

#### Source Assessment

1. Contacted EPA and received one Superfund PCB cleanup report in watershed. Followed up later and found several additional PCB cleanups in watershed received reports of most of these and discussed remainder with EPA (Perry Gaughan, Jack Downie, Bob Kelley, and Scott Rice), Winter 2003.
2. Contacted WV DEP staff, requested information concerning Superfund cleanups or other potential PCB related activity/industry upstream, or up dip in watershed in either WV or VA, Spring 2004.
3. Investigated groundwater movement from VW into VA as a possible vehicle for transport of PCBs from VW site into VA at Dill's Spring. Received public questions related to groundwater infiltration of PCBs into Dill's Spring (Bluefield VA drinking water source) from WV Superfund site, Joy Mfg. Investigated potential PCB in groundwater problem with Va Cave Board, the local caving group, local professional geologists, and DMME underground karst system from one of the EPA cleanup sites that might drain into Dill Spring, Spring 2004.
4. Reviewed PREP complaint records in SWRO for the watershed since 1970s, Spring 2004.
5. Reviewed groundwater data from inactive part of landfill with drainage into watershed, Spring 2004.
6. Received letter request from VDH Charles Rest, for additional sampling above WTP in Bluestone reservoir. Received response to VDH letter from Jean Gregory with sampling plan. Assisted with follow up fish tissue and sediment sampling Fall 03 with VDGIF and Rick Browder from VADEQ CO, to determine extent of PCB contamination upstream of WTP. Provided suggestions to VDH and Town of Bluefield on PCB sampling of potable water.
7. Conducted surveys of 200+ industries/individuals in watershed, VA and WVA by: Obtaining a list of industries and contacts upstream of the WTP from the Town. Plan to contact industry personnel and use survey form to inquire about PCB usage, 2/04.

8. Planned for and conducted Bluestone River semi-permeable membrane device (SPMD) at 8 sites, deployment with CO Roger Short and USGS support (March 31-April 30, 2004).
9. Planned PCB sediment sampling from industrial sites and SPMD locations (financed by EPA -- coordinated with WVDEP and local Bluestone River watershed group).
10. Obtained permissions from property and business owners and operators in watershed to sample sediments and soils in Bluestone River watershed.
11. Designed sampling plan for Bluestone River sediments and storm drain sludge in VA and WV. Conducted sampling with WVDEP (Penny Harris), EPA (Perry Gaughan), and contractor ENE, (Mike Strazisar), (April, May 2004).
12. Sample additional Bluestone River sites, (found by the DEQ investigation) with EPA (Perry Gaughan) and contractor ENE, (Mike Strazisar), (July 7, 2004).
  - a) Bowen Field, VA (municipal park owned by city of Bluefield, WV), for PCBs; and
  - b) NeMours, WV for Dioxins and PCBs above drinking water plant intake for Pocahontas, VA and other areas.
13. Forwarded information on dioxin screening results and abandoned transformer operation site in NeMours, WV above water supply of Virginia residents to VDH, (Charles Rest).
14. Investigated groundwater movement from VW into VA as a possible vehicle for transport of PCBs from VW site into VA at Pocahontas. Met with hydrogeologists from WVDEP (Nick Shaer & George Dasher) to discuss Bluestone River and Laurel Fork, Groundwater contaminant transport as it relates to PCBs from Mercer County, WV to Virginia and vice versa with WVDEP inspector, (Penny Harris) and SWRO TMDL coordinator (Nancy Norton) (July 27, 2004).
15. Redeployed two SPMDs in Bluestone River where they had been beached part of the time during the previous April deployment. (July 27, 2004 to August 26, 2004).
16. Received anonymous citizen information about buried transformers at a site near Pocahontas. Arranged meeting with EPA (Perry Gaughan) and anonymous citizen to determine location of large quantity of buried transformers above Pocahontas on Laurel Fork (August 3, 2004).
17. Planned to redeploy low flow SPMDs in Bluestone River watershed at same sites as before (Sept. 30, 2004).
18. Review data from items 11, 12, 15, and 17, and follow-up with appropriate agencies for cleanup.
19. Final report on PCB source assessment investigation --Summer 2005 (dependent upon timeframes needed for sample analysis for item 15, & 17.)

Initiated coordination with West Virginia Department of Environmental Protection

1. Contacted WV TMDL to discuss DEQ PCB data and inquire about any WV PCB data from the Bluestone. Shared DEQ PCB data with WV, Summer 2003. WV



DEP attended the TMDL meetings and became an active partner in the PCB source assessment work.

#### Enlisted input from Stakeholders during the benthic and bacterial TMDL process

1. TMDL fecal and benthic announcement in Virginia Register, informed public of PCB issue and announced the PCB discussion and source identification phase to be held during the TMDL meeting, September 11, 2003.
2. TMDL newsletter for the bacteria and benthic impaired segment, informed public of PCB issue and announced the PCB discussion and source identification phase to be held during the TMDL meeting, September 11, 2003.
3. First public meeting September 11, 2003 for Bluestone TMDL, bacteria and benthic segment. Informed public of PCB issue. Public and VDH concerned about the Town WTP in the PCB segment. Public provided suspected PCB sources in watershed.
4. Talked to reporters about the issues and public concerns. Newspaper article followed, September 2003.
5. Held second PCB public meeting for Bluestone River PCB impairment to address public exposure concerns from previous TMDL meeting, including a special presentation coordinated with VDH, Charles Rest and town of Bluestone, Todd Miller (March 18, 2004).
6. Attended and presented status of PCBs assessment at Bluestone River Watershed group startup meeting, (July 22, 2004).

#### Source Assessment

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19. Final report on PCB source assessment investigation --Summer 2005 (dependent upon timeframes needed for sample analysis for item 15, & 17,)

***TMDL Activities:*** In 2003, DEQ initiated a TMDL project addressing bacteria and biological impairments on the Bluestone River in the New River Basin. Taking advantage of the substantial stakeholder outreach efforts during this TMDL development project, PCB-related information was solicited at the same time. By leveraging both state and federal resources, a significant amount of source and water quality information has been compiled. The TMDL is expected to be completed in mid-2005.